

EPA QUA      Endosulfan      Case #: 0014      AI #: 79401  
Analyst:      Steven M. Nako      April 22, 1999      Updated by:      David Donaldson      September 10, 2000

### Endosulfan Usage: Food Crops

Based on available pesticide survey usage data for the years 1990 through 1999, total average annual use of endosulfan is estimated at approximately 1.38 million pounds of active ingredient (lbs ai). Endosulfan is registered for use on numerous fruits, nuts and vegetable crops. Typical application rates for these food crops range from 0.5 lbs ai/acre to 1.0 lbs ai/acre, with 1-2 applications made per season. In terms of pounds applied, cotton, tomatoes, potatoes, and apples are major use sites, with approximately 286,000 lbs ai, 55,000 lbs ai, 120,000 lbs ai and 110,000 lbs ai applied annually to these crops, respectively.

The accompanying table also presents 'likely average' and 'likely maximum' Percent of Crop Treated (%CT) projections, by crop. A relatively large percent of various cucurbits are treated with endosulfan (e.g, 31% of cantaloupes, 40% of squash, and 19% of honeydew melons), as are pumpkins (20%), pears (20%), strawberries (14%) and tomatoes (6%). As is often the case for many insecticide uses, the actual %CT may (depending upon the crop) fluctuate considerably from year to year due to varying pest pressures (e.g., weather related infestations), and economic factors. The likely maximum %CT projections are designed to account for these factors, as well as for uncertainty within and across the various survey estimates.

### Endosulfan Usage: Non-food Crops/Sites

Endosulfan is also applied to various ornamental plants and shrubs in horticultural nurseries, and ornamentals. As much as 80,000 lbs ai of endosulfan are believed to be applied by horticultural nurseries in greenhouses; mainly to control for aphids, whiteflies and thrips (USDA, NAPIAP Report, 1-CA-96). Residential use of endosulfan is believed to be negligible. According to the 1993 Certified/Commercial Pesticide Applicator Survey, an estimated 75 lbs ai of endosulfan were also applied to residential sites by for-hire applicators.

Site	Acres (000) Grown	Acres (000) Treated		% of Crop Treated		Lb ai (000) applied		Average Application Rates			States of Most Usage
		Wtd Avg	Est Max	Wt d Avg	Est Max	Wtd Avg	Est Max	lb ai / A / yr	# appl / yr	lb ai / A / appl	% of total lb ai used on this site
Blueberries	59	1	3	2%	6%	1	3	0.79	1.5	0.52	NC GA NJ 100%
Strawberries	51	7	11	14%	21%	9	14	1.27	1.38	0.92	OR MI CA WI NY 76%
Grapes	825	12	47	1%	6%	17	102	1.44	1.39	1.03	CA OR 82%
Grapefruit	194	2	10	1%	5%	3	14	1.5	2	0.75	FL 100%

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		Wtd Avg	Est Max	Wt d Avg	Est Max	Wtd Avg	Est Max	lb ai / A / yr	# appl / yr	lb ai / A / appl	% of total lb ai used on this site
Oranges	867	3	10	0%	1%	4	14	1.35	1.71	0.79	FL 86%
Pineapple (flowering ac.)	12	0	1	2%	6%	1	2	3	2	1.5	HI 100%
Citrus, Other /1	51	0	<1	0%	<1%	0	1	11.96	2.99	4	FL 100%
Apples	572	72	114	13%	20%	110	215	1.53	1.42	1.08	WA NY MI MN ID NC 71%
Pears	78	15	37	20%	48%	35	85	2.26	1.24	1.82	WA OR CA 83%
Apricots/Nectarines	57	1	2	2%	4%	2	3	1.71	2.03	0.84	FL NJ WA CO PA AL 82%
Cherries, Total	95	2	6	3%	7%	5	12	2.11	1.18	1.79	UT MI WA CA NY 82%
Cherries, Sweet	47	2	4	5%	8%	5	9	2.22	1.2	1.85	WA MI 90%
Cherries, Tart	49	0	2	1%	5%	0	3	1.35	1.02	1.33	MI 100%
Peaches	212	16	35	7%	17%	29	91	1.85	2.63	0.7	GA MI NJ AR FL MS 63%
Plums & Prunes	164	5	12	3%	7%	8	21	1.81	1	1.81	WA OR CA
Plums	64	3	8	4%	12%	5	14	1.81	1	1.81	WA OR CA 86%
Prunes	100	2	4	2%	4%	4	7	1.81	1	1.81	WA OR CA 86%
Almonds	429	0	<1	0%	<1%	0	1	2.41	1.01	2.38	CA 100%
Hazelnuts (Filberts)	27	2	5	7%	18%	2	5	1	1	1	OR WA 100%
Macadamia Nuts	20	2	6	7%	30%	-	-	-	-	-	HI 100%
Pecans	488	51	88	11%	18%	59	138	1.15	1.86	0.62	GA OK MS 81%
Walnuts	205	1	2	0%	1%	1	3	1.41	1.58	0.9	CA 95%
Eggplant	4	2	3	41%	83%	3	6	1.91	3.63	0.53	FL NJ 89%
Peppers, Total	78	10	13	12%	17%	14	32	1.55	2.45	0.63	FL TX CA NC
Peppers, Bell	55	9	10	16%	19%	14	30	1.59	2.59	0.61	FL TX CA NC

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Peppers, Hot	23	1	3	4%	12%	1	2	0.80	1.00	0.80	CA 100%
Tomatoes, Total	465	29	53	6%	11%	55	96	1.90	2.70	0.70	FL MI NJ NC GA
Tomatoes, Fresh	136	24	40	18%	29%	50	83	2.00	3.00	0.69	FL MI NJ NC GA 95%
Tomatoes, Proc.	329	5	13	2%	4%	5	13	1.00	1.20	0.80	MI NJ 100%
Broccoli	114	15	30	13%	26%	16	32	1.06	1.32	0.8	AZ CA 85%
Brussels Sprouts	3	0	<1	2%	10%	0	<1	0.8	1	0.8	CA 100%
Cabbage, Total	92	13	25	14%	27%	18	49	1.33	2.06	0.65	FL TX NY
Cabbage, Fresh	86	12	23	14%	27%	17	47	1.38	2.09	0.66	FL TX 93%
Cabbage, Proc.	6	1	2	16%	32%	1	2	0.89	1.69	0.53	NY 100%
Cauliflower	58	5	19	9%	32%	4	15	0.78	1.18	0.66	CA AZ FL 86%
Collards	11	1	2	6%	17%	1	4	2	1	2	CA FL NJ 95%
Lettuce	324	46	100	14%	31%	58	143	1.27	1.76	0.72	AZ CA 85%
Spinach, Fresh	19	1	2	4%	11%	1	1	0.64	1	0.64	TX CO AZ 83%
Celery	37	2	4	6%	11%	2	4	0.97	1.55	0.62	MI CA 88%
Artichokes	13	0	1	2%	6%	0	0	0.37	1	0.37	CA 100%
Mustard Greens /2	13	1	2	6%	17%	-	-	-	-	-	-
Watercress /2	1	0	<1	0%	<1%	-	-	-	-	-	-
Other Leafy Vegetables /2	20	0	1	<1 %	5%	-	-	-	-	-	-
Garlic /2	36	0	<1	0%	<1%	-	-	-	-	-	-
Cucumbers	172	15	26	8%	15%	27	47	1.82	2.03	0.9	FL GA TX MI
Cucumbers, Fresh	55	10	15	17%	27%	22	33	2.26	2.42	0.93	GA FL MI 87%

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Cucumbers, Proc.	117	5	10	4%	9%	5	11	1.07	1.29	0.83	FL TX 95%
Pumpkins	36	7	13	20%	36%	11	20	1.48	1	1.48	IL VA PA NJ IN NC 69%
Squash	53	21	45	40%	84%	44	94	2.07	1	2.07	FL MI NJ CA MD 81%
Cantaloupes	113	35	64	31%	57%	39	106	1.15	1	1.15	CA AZ 90%
Melons, Honeydew	27	5	15	19%	58%	6	19	1.25	1.79	0.7	CA AZ TX 100%
Watermelons	258	32	43	12%	17%	40	56	1.26	1	1.26	TX FL OK 85%
Carrots	107	2	5	2%	5%	1	3	0.56	1	0.56	CA 97%
Sweet Potatoes	65	20	30	31%	46%	20	30	1	2	0.5	LA TX MN NJ MS CA
Roots&Tubers/2	240	10	15	4%	6%	13	20	1.3	1	1.3	-
Potatoes	1,421	144	234	10%	16%	120	187	0.83	1.31	0.63	ND WI ME CO MI ID 51%
Sweet Corn	784	3	5	0%	1%	4	7	1.4	2	0.7	CA FL MI NC 90%
Beans, Dry	1,802	2	57	0%	3%	5	163	2.87	4.64	0.62	CA 98%
Beans, Lima	35	1	2	2%	6%	-	-	-	-	-	GA 100%
Beans, Snap Total	200	3	11	2%	6%	5	17	1.5	2.5	0.6	FL GA CA WA NC
Beans, Snap Fresh	65	1	4	2%	6%	2	6	1.5	2.5	0.6	FL GA CA 84%
Beans, Snap Processed	135	2	8	2%	6%	3	11	1.5	2.5	0.6	FL GA WA NC 82%
Peas, Dry	249	0	11	0%	4%	0	10	0.94	1	0.94	TX 80%
Peas, Green	386	1	16	0%	4%	1	42	2.52	1	2.52	NJ FL 90%
Alfalfa	23,949	15	47	0%	0%	10	30	0.66	1.45	0.45	CA OK WA UT AZ 91%
Barley	7,505	0	2	0%	0%	0	1	0.33	1	0.33	CO 100%
Oats\Rye	6,133	0	1	0%	0%	0	0	0.6	1	0.6	AR ME 100%
Wheat, Winter	45,854	41	79	0%	0%	20	43	0.49	1.25	0.39	OK KS TX TN 83%
Field Corn	75,000	12	40	0%	0%	7	24	0.6	1	0.6	-

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Soybeans	62,879	42	103	0%	0%	13	31	0.32	1	0.31	OH LA IA 83%
Sunflower	2,745	17	88	1%	3%	2	9	0.12	1	0.12	MN SD TX 92%
Safflower	235	0	20	0%	9%	-	-	-	-	-	-
Canola\Rapeseed	1,200	0	20	0%	2%	-	-	-	-	-	-
Sugar Beets	1,415	2	4	0%	0%	3	6	1.51	1.28	1.18	OH CA 88%
Sugarcane	926	0	<1	0%	<1%	-	-	-	-	-	-
Tobacco	695	54	84	8%	12%	63	97	1.17	1.36	0.86	KY GA NC TN 82%
Cotton	13,000	286	520	2%	4%	286	520	1	2.5	0.4	MS LA TX AZ 84%
Subtotal Agricultural Use	-	1,16 2	1,77 6	-	-	1,33 2	2,14 4	-	-	-	-
Non-Agricultural Sites:											
Horticultural Nurseries	-	-	-	-	-	50	80	-	-	-	-
Residential: Outdoors	-	-	-	-	-	0	1	-	-	-	-
Subtotal Non-Agric. Use	-	-	-	-	-	50	81	-	-	-	-
Total Use (1,000 Lbs AI)	-	-	-	-	-	1,38 2	2,22 5	-	-	-	-

FOOTNOTES TO ACCOMPANY ENDOSULFAN QUA TABLES,  
COLUMN HEADINGS

Weighted average--the most recent years and more reliable data are weighted more heavily.

Est Max = Estimated maximum, which is estimated from available data.

Average application rates are calculated from the weighted averages.

NOTES ON TABLE DATA

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Usage data primarily covers 1990 - 1999.

Calculations of the above numbers may not appear to agree because they are displayed as rounded:

to the nearest 1000 for acres treated or lb. a.i. (Therefore 0 = < 500)

to the nearest whole percentage point for % of crop treated. (Therefore 0% = < 0.5%)

0\* = Available EPA sources indicate that no usage is observed in the reported data for this site (%CT=0).

A dash (-) indicates that information on this site is NOT available in EPA sources or is insufficient to generate %CT estimates.

#### CROP GROUPS

/1 Citrus, Other includes kumquats, limes, tangelos, and tangerines.

/2 Other Leafy Vegetables include Endives, Kale and Kohlrabi. Roots & Tubers include radish, rutabega, turnip and turnip greens.

Sources (Cal EPA, Doane-Crop Groupings) indicate little/no use on Endives, Garlic and Watercress; use on Mustard Greens similar to collards.

#### DATA SOURCES

Agricultural (Crop) Sites: USDA Agricultural Chemical Usage Reports, NCFAP, and various proprietary data sources, including Doane, Maritz, Mike Buckley.

Pineapple estimates from Calvin Oda, Pineapple Growers Assoc. of Hawaii, 4/21/99, memo to Nako;

Macadamia nut estimates from Alan Yamaguchi, Hawaii Macadamia Nut Assoc., 4/21/99, personal communications with Nako.

Non-Agric. (Non-Food Crop) Sites: USDA, Biological and Economic Assessment of Chlorpyrifos and Diazinon in Ornamentals and Sod Production, 11/94;

USDA, Biological and Economic Assessment of Pest Management in the United States Greenhouse and Nursery Industry, NAPIAP Report, 1-CA-96;

1993 Certified/Commercial Pesticide Applicator Survey; Kline; SRI.